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FOREST SERVICE
U.S. DEPARTMENT OF AGRICULTURE
IN COOPERATION WITH THE UNIVERSITY OF CALIFORNIA
BERKELEY

Research Note No. 9 April 10, 1936

LUMBER SELLING VALUES OF LOGS FROM INSECT-INFESTED PONDEROSA AND JEFFREY-PINE TREES SALVAGED IN 1935 ON AN EAST-SIDE PINE REGION AREA 1/

California pine region logging operators are well aware that insect-killed ponderosa and Jeffrey pine trees deteriorate very rapidly. The blue-staining which follows attack by most species of insects frequently appears in scattered spots with the first working of the new larvae two or three weeks after the spring and summer deposits of eggs by the parent adult beetles. Within six to ten weeks after attack, the sapwood may be so heavily stained as to be practically unmerchantable. The fact that most of this stained lumber is intrinsically just as sound and serviceable as it would be without the discoloration does not help the mill operator in disposing of this stained stock. Stain is specified as a degrading defect in the pine grading rules, the extent of degrade depending on the amount and intensity of the stain, and lumber users generally do not easily accept any sudden changes in these long established specifications. From the standpoint of appraising the probable returns from salvage operations in insect-infested timber, then, one of the most important practical considerations is that of lumber realization values on the basis of present grading rules, at various periods following insect-attack.

In the spring of 1935, the Office of Forest Management, Region 5, U. S. Forest Service, and the Berkeley Forest Insect Laboratory, Bureau of Entomology and Plant Quarantine, U. S. Department of Agriculture, secured the cooperation of a large operator in the east-side pine region in conducting an experimental "bug-tree" salvage operation over an area of approximately 6000 acres. The particular interest of the entomologists who spotted the trees was in the feasibility and effectiveness of salvage logging as an insect control measure. Most of the trees marked for cutting by the entomologists, therefore, ranged from those newly attacked to those in which the broods had not yet developed beyond the pupal stage.

1/ By M. R. Brundage, Associate Forester, and T. J. Orr, Jr., Junior Forester, Section of Forest Products.

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Obviously no reduction of potential insect population would result by removing trees from which all or most of the new beetles had already emerged. Many abandoned trees (attacked in 1934) were cut by the operator, however, consequently logs were available for mill study which represented every life stage of the insects from new attacks to emergence. No trees killed prior to 1934 were logged.

About 450 of the logs from this experimental salvage operation were covered by a mill production study. All boards were numbered so that the lumber from each log could be identified. After seasoning, - part in the yard and part in kilns - the lumber was graded rough-dry by an Inspector of the Western Pine Association. The grade of each board as it would have been without stain and other defects attributable to insect infestation was recorded, as well as the final grade after making allowance for these defects. Both sets of grades were evaluated by application of 1935 lumber selling prices.

The insect-stain classes used in the tables at the end of this note are approximately the same as the salvage classes used by J. R. Berry, Logging Engineer of the U. S. Forest Service, in a preliminary analysis of brood stages in relation to the proportion of gross-scale volume affected by blue stain as estimated by the log scaler. His results were later condensed by Dr. K. A. Salman of the Bureau of Entomology and Plant Quarantine as follows:

Insect species	Brood stages present on logs			
Melanophila californica (Flat-head)	New attack; eggs, Small larvae	Large larvae	Prepupal larvae; Pupae	Pupae and beyond
Dendroctonus brevicomis (Western pine beetle) D. monticolae (Mountain pine beetle) Ips oregoni	New attack; eggs		Small and large larvae	Few large larvae, mostly pupae and beyond
Ips emarginatus	Attack; eggs, Small larvae; SCATTERED ATTACKS ONLY		Attack; eggs, Small larvae; GENERAL ATTACK	Small and large larvae and beyond
	Approximate average percent of gross scale affected by blue stain in each group of logs infested as above, as estimated by the log scaler:			
	Less than 1	10	25	50
Salvage class	I	II	III	IV

The insect-stain classes used in grouping the logs for the summarization of average lumber selling values by species, sizes and log grades, as shown in tables 1 to 7, inclusive, give greater weight to the scaler's and log grader's notes regarding amount and degree of stain visible in each log, and the proportion of the log surface infested, irrespective of the brood stages present. This resulted in the shifting of some logs having flat-heads only from salvage classes II and III to insect-stain class I, and of a few logs infested by other insect species from salvage class II to insect-stain class I, from III to II, and from IV to III. A more detailed explanation of the insect-stain classes will be given in the final report of this study. In connection with this preliminary summary, it is sufficient to consider the insect-stain classes as corresponding to the salvage classes except for re-allocations of occasional logs from a poorer to the next better class number when infestation was localized on comparatively small portions of the surface and stain visible to scaler and log grader appeared appreciably less serious than the average for other logs in the same salvage class. Class I includes some uninfested logs, which came, however, from infested trees.

Logs were graded on the mill-deck strictly on the basis of their surface appearance, i.e., as they would have been graded if entirely uninfested by insects. The grades may be described briefly as follows:

Grade 1. Surface clear to 90 percent surface clear logs.
Grade 2A. High class Shop type logs.
Grade 2B. Medium class Shop type logs.
Grade 3. Common type logs with small red knots.
Grade 4A. #3 Shop and #3 Common large knotted type, and Common type logs with small, dead knots.
Grade 4B. Large knotted, rough logs.

Without complementary cost data, it is impossible, of course, to draw definite conclusions regarding profit and loss in the various classes of logs from the selling-prices given in the tables. Nevertheless it is reasonable to infer that most of the Grade 1, 2A, 2B, and 3 logs falling in insect-stain classes I and II will return a fair margin above logging and milling costs on most operations. Tractor and truck logging enable loggers to reach out for considerable distances beyond the limits of their normal settings without any prohibitive increase in stump-to-pond expense, and sawmilling costs should not exceed the normal. Operators may thus draw their own conclusions, in a rough way, at least, by deducting their regular costs from the values tabulated.

From the standpoint of the operator-owner having a large body of virgin timber in which insect losses are serious, the value of salvage logging as a control measure must also be balanced against the net operating margin. From this angle, may it not pay to remove all logs on which the broods are in such a stage of development that the total emergence of new generations of tree-killing beetles will be appreciably reduced? The entomologists who are studying the problem need a great

deal more information from field observations before they can answer this question. It is hoped that other pine-region operators will undertake experimental salvage-logging of infested timber and thereby shorten the time which must elapse before more definite conclusions can be reached.

EXPLANATION OF TABLES

Tables 1 to 6, inclusive, have been arranged for easy comparison of ponderosa pine with Jeffrey pine realization values from logs of the same external grade appearance, insect-stain class, and log-diameter group. It will be noted that the Jeffrey pine logs were consistently lower in value than the ponderosa pine logs, both with and without the stain degrade.

Values which appear too low for the grade to which logs were assigned on the deck are almost invariably the result of pitch and pitch pockets. These are normal pitch defects, common in the section where the study was conducted, and are not the result of insect attack. From external appearance alone, the logs were necessarily graded as indicated. The most striking example of fall-down from pitch is that shown in ponderosa pine, log Grade 1, insect-stain Class III, size group 30-34 inches. The average value of these two logs, even without stain, was lower than the values of many logs in Grade 4A.

Captions and headings used in the tables are to be interpreted as follows:

PP = ponderosa pine.
JP = Jeffrey pine.
Class I, II, III and IV are the insect-stain classes explained above.
Logs = Number of logs observed in the mill study. These do not represent the woods-run distribution of the various classes in all logs salvaged during the season. The proportion of logs in Class IV was much greater in the mill study logs than in the salvage log-run for the season.
Value A $ = Rough-dry selling value per M mill tally, #5 Common and Better, of the lumber without stain but allowing for normal seasoning and handling defects, such as check, split, and warp.

Value B $ = Rough-dry selling value per M mill tally, #5 Common and Better, allowing for all defects caused by insect infestation.

Depr. % = Percent of depreciation in lumber realization value, from "Value A" to "Value B", caused by the stain and other degrade chargeable entirely to insect infestation.

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Depr. % = Percent of depreciation in lumber realization value, from "Value A" to "Value B", caused by the stain and other degrade chargeable entirely to insect infestation.

TABLE 1
LOG GRADE 1

	Log-diameter group, inches											
	15-19	20-24		25-29		30-34	°	45-49				
	PP	PP	JP	PP	JP	PP		PP				
	CLASS I											
Logs		2		4		1						
Value A $		22.97		27.71		31.15						
Value B $		22.57		27.39		31.07						
Depr. %		1.7		1.2		0.3						
	CLASS II											
Logs	1			1	1							
Value A $	30.25			27.09	24.48							
Value B $	28.25			25.08	23.06							
Depr. %	6.6			7.4	5.8							
	CLASS III											
Logs		1		1	1	2						
Value A $		30.86		30.81	22.53	19.88						
Value B $		26.13		27.48	18.82	15.44						
Depr. %		15.3		10.8	16.5	22.3						
	CLASS IV											
Logs		2	4	4	5	1		1				
Value A $		32.25	27.16	25.96	26.45	23.72		33.09				
Value B $		17.96	16.49	16.67	15.11	14.67		20.49				
Depr. %		44.3	39.3	35.8	42.9	38.2		38.1				

° No Grade 1 logs of size classes 35-44 inches in mill-study sample.

TABLE 2
LOG GRADE 2A

	Log-diameter group, inches													
	15-19	20-24		25-29		30-34		35-39	40-44	45-49				
	JP	PP	JP	PP	JP	PP	JP	PP	PP	PP				
	CLASS I													
Logs		1	2	1	2			1	1					
Value A $		26.28	23.18	25.55	20.03			29.66	29.62					
Value B $		25.70	23.18	25.27	20.03			29.66	29.62					
Depr. %		2.2	0.0	1.1	0.0			0.0	0.0					
	CLASS II													
Logs	2	1			3	2								
Value A $	23.26	23.38			22.10	24.91								
Value B $	20.61	20.87			19.61	24.00								
Depr. %	11.4	10.7			11.3	3.6								
	CLASS III													
Logs	2	2	2	1	1	2								
Value A $	23.18	26.00	26.49	22.11	20.59	26.91								
Value B $	19.52	22.11	19.41	19.96	19.12	22.00								
Depr. %	15.8	15.0	26.7	9.7	7.1	18.2								
	CLASS IV													
Logs		6		10	1	1	4	1		1				
Value A $		25.13		23.49	26.99	31.60	22.00	20.20		29.66				
Value B $		18.66		15.98	12.78	18.07	15.88	14.71		20.77				
Depr. %		25.7		32.0	52.6	42.8	27.8	27.2		30.0				

TABLE 3
LOG GRADE 2B

	Log-diameter group, inches											
	15-19		20-24		25-29		30-34		35-39	40-44		
	PP	JP	PP	JP	PP	JP	PP	JP	PP	PP		
	CLASS I											
Logs	1		1	7	2	7	1	1				
Value A $	19.89		23.81	21.33	21.94	20.99	28.48	18.65				
Value B $	19.77		23.81	21.27	21.70	20.80	28.24	18.65				
Depr. %	0.6		0.0	0.3	1.1	0.9	0.8	0.0				
	CLASS II											
Logs			1		1	1	2					
Value A $			19.93		23.50	24.89	25.40					
Value B $			14.66		20.83	22.48	23.06					
Depr. %			26.4		11.4	9.7	9.2					
	CLASS III											
Logs	1	2	1	3	3	1	3					
Value A $	20.08	20.02	20.08	21.65	23.20	22.28	20.31					
Value B $	15.40	17.74	17.69	17.03	17.76	15.53	17.80					
Depr. %	23.3	11.4	11.9	21.3	23.4	30.3	12.4					
	CLASS IV											
Logs	1	2	14	6	13	5	4	4	2	1		
Value A $	21.29	22.11	21.02	20.82	22.72	22.22	24.45	22.46	23.59	23.38		
Value B $	17.42	15.97	16.38	13.48	16.86	14.11	18.06	14.80	15.70	17.03		
Depr.	18.2	27.8	22.1	35.2	25.8	36.5	26.1	34.1	33.4	27.2		

TABLE 4
LOG GRADE 3

	Log-diameter group, inches							
	10-14		15-19		20-24		25-29	
	PP	JP	PP	JP	PP	JP	PP	
	CLASS I							
Logs	1	2	1	1				
Value A $	23.39	20.33	25.39	22.17				
Value B $	23.39	20.33	25.39	22.17				
Depr. %	0.0	0.0	0.0	0.0				
	CLASS II							
Logs	3		4	1		1		
Value A $	20.84		24.33	22.14		18.08		
Value B $	20.60		22.89	22.14		17.86		
Depr. %	1.1		5.9	0.0		1.2		
	CLASS III							
Logs	1		4	1	3	1		
Value A $	24.29		21.80	22.32	23.21	19.48		
Value B $	17.11		18.26	17.91	20.98	14.52		
Depr.	29.6		16.2	19.8	9.6	25.5		
	CLASS IV							
Logs	1		5	1	1		1	
Value A $	18.97		21.24	14.10	21.42		22.82	
Value B $	16.57		18.68	10.43	16.89		17.05	
Depr. %	12.6		12.0	26.0	21.1		25.3	

TABLE 5
LOG GRADE 4A

	Log-diameter group, inches									
	10-14		15-19		20-24		25-29		30-34
	PP	JP	PP	JP	PP	JP	PP	JP	JP
	CLASS I								
Logs	3	8	3	14	2	13	1	2	
Value A $	18.56	19.16	20.43	19.35	20.53	19.21	18.98	18.31	
Value B $	18.42	19.03	20.42	19.29	20.39	19.15	18.78	17.38	
Depr. %	0.7	0.7	0.0	0.3	0.7	0.3	1.0	5.1	
	CLASS II								
Logs	3	3	3	4	2	4		1	
Value A $	21.47	19.45	21.09	19.83	20.61	19.83		20.00	
Value B $	20.11	17.95	19.35	18.61	19.37	18.21		19.21	
Depr. %	6.3	7.7	8.2	6.1	6.0	8.2		3.9	
	CLASS III								
Logs	3	2	3	2	8	3	2	1	
Value A $	19.90	20.50	20.58	17.62	19.88	19.04	20.26	15.34	
Value B $	17.31	18.22	18.55	15.97	17.27	17.01	18.07	14.18	
Depr. %	13.0	11.1	9.9	9.4	13.1	10.7	10.8	7.6	
	CLASS IV								
Logs	5	3	16	6	23	12	9	3	1
Value A $	19.02	19.12	20.00	19.47	20.07	19.66	20.27	20.50	21.50
Value B $	15.28	13.40	16.91	16.44	16.11	15.19	15.15	15.58	15.57
Depr. %	19.7	29.9	15.4	15.6	19.7	22.7	25.3	24.0	26.0

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TABLE 6
LOG GRADE 4B

	Log-diameter group, inches							
	10-14	15-19		20-24		25-29	
	JP	PP	JP	PP	JP	PP	JP
	CLASS I						
Logs	4	1	5		4		
Value A $	16.21	15.40	13.01		16.58		
Value B $	16.21	15.04	12.49		16.58		
Depr. %	0.0	2.3	4.0		0.0		
	CLASS II						
Logs	1				3		
Value A $	15.31				13.48		
Value B $	15.31				12.75		
Depr. %	0.0				5.4		
	CLASS III						
Logs	3		2				
Value A $	18.34		20.27				
Value B $	15.95		17.16				
Depr. %	13.0		15.3				
	CLASS IV						
Logs	1	9	8	3	5	2	2
Value A $	16.34	17.54	15.01	16.42	14.46	16.45	17.19
Value B $	11.51	14.97	12.61	12.37	12.46	13.62	12.15
Depr. %	29.6	14.6	16.0	24.7	13.8	17.2	29.3

Summary by species, log grades and insect-stain classes

TABLE 7

Log grade	Item	Insect-stain classes and species							
		I		II		III		IV	
		PP	JP	PP	JP	PP	JP	PP	JP
1	Logs	1	6	2	1	4	1	8	9
	Av. dia.	33"	26"	24"	28"	27"	25"	29"	25"
	Value A $	31.15	26.53	28.00	24.48	23.83	22.53	28.87	26.67
	Value B $	31.07	26.19	25.99	23.06	19.61	18.82	17.87	15.54
	Depr. %	0.3	1.3	7.2	5.8	17.7	16.5	38.1	41.7
2A	Logs	4	4	3	5	5	5	19	5
	Av. dia.	32"	24"	28"	23"	27"	22"	27"	31"
	Value A $	28.65	21.29	24.62	22.36	25.90	23.90	24.92	22.74
	Value B $	28.55	21.29	23.42	19.84	21.70	19.37	17.22	15.40
	Depr. %	0.3	0.0	4.9	11.3	16.2	18.9	30.9	32.3
2B	Logs	5	15	3	2	8	6	35	17
	Av. dia.	26"	25"	31"	24"	27"	22"	26"	26"
	Value A $	24.16	20.90	24.88	22.76	21.41	21.47	22.65	21.89
	Value B $	23.98	20.77	22.44	19.12	17.65	16.81	16.84	14.27
	Depr. %	0.7	0.6	9.8	16.0	17.6	21.7	25.6	34.8
3	Logs	2	3	7	2	8	2	8	1
	Av. dia.	15"	13"	15"	18"	17"	19"	20"	17"
	Value A $	24.49	21.20	23.44	19.74	22.71	20.70	21.61	14.10
	Value B $	24.49	21.20	22.30	19.60	19.53	15.97	17.66	10.43
	Depr. %	0.0	0.0	4.9	0.7	14.0	22.8	18.3	26.0
4A	Logs	9	37	8	12	16	8	53	25
	Av. dia.	18"	18"	17"	20"	20"	22"	20"	25"
	Value A $	19.78	19.16	20.92	19.81	20.08	17.87	20.07	19.92
	Value B $	19.66	19.02	19.48	18.45	17.66	16.13	15.97	15.45
	Depr. %	0.6	0.7	6.9	6.9	12.0	9.7	20.4	22.4
4B	Logs	1	13	0	4	0	5	14	16
	Av. dia.	17"	17"		20"		14"	20"	20"
	Value A $	15.40	15.13		13.67		19.42	16.96	15.31
	Value B $	15.04	14.93		13.02		16.63	13.91	12.44
	Depr. %	2.3	1.3		4.8		14.4	18.0	18.7